Lasers in Surgery and Medicine 26:380–385 (2000)

Nd:YAG Laser Surgery for the Excision of Pilonidal Cysts: A Comparison With Traditional Techniques

J. Alexander Palesty, MD,[1] Khalique S. Zahir, MD,[1] Stanley J. Dudrick, MD, FACS,[1,2] Stephanie Ferri, MD,[1] and Guiseppe Tripodi, MD[1]

[1]St. Mary's Hospital Department of Surgery, Waterbury, Connecticut 06706
[2]Yale University School of Medicine, New Haven, Connecticut 06510

Background and Objective: **Nd:YAG laser photothermal ablation has been accepted as a treatment modality for hemorrhoidal disease. There is little reported on its use in treating pilonidal disease. We hypothesized that laser would be an excellent tool for pilonidal cystectomy, facilitating improved outcome and patient satisfaction.**
Study Design/Materials and Methods: **A 5-year retrospective study was performed comparing Nd:YAG laser to the standard surgical technique. A telephone questionnaire addressing the length of time the cyst was debilitating both preoperatively and postoperatively as well as length of convalescent time before return to work was administered. Pain was assessed by using an analog pain scale.**
Results: **Operative time for the traditional pilonidal cystectomy was 20 minutes longer than Nd:YAG laser cystectomy. Postoperative hospital stay was similar. Laser patients returned to work an average of 2.4 days earlier, and their postoperative pain was less than those treated traditionally.**
Conclusion: **In an era when the medical consumer makes decisions based on the efficacy of treatment by using criteria such as pain, length of hospitalization, and speed of return to work, Nd:YAG lasers have emerged as a surgical tool that can fulfill these criteria for certain procedures. Patient postoperative satisfaction after laser excision was greater when compared with those who had traditional excisions. Postoperative pain was less, as was the pain experienced during the first week of recovery. Cost for both was comparable. Lasers Surg. Med. 26:380–385, 2000** **© 2000 Wiley-Liss, Inc.**

Key words: Nd:YAG, laser Surgery, debilitation, postoperative pain, recovery, return to work

INTRODUCTION

Pilonidal disease, an acute or chronic infection of the natal cleft located in the sacrococcygeal or posterior anal regions, continues to be a topic of controversy with regard to the modality of surgical treatment. The word pilonidal literally means "nest of hairs" and it is commonly associated with hirsute individuals, particularly men [1]. Part of the problem concerning the treatment of pilonidal disease centers around the fact that there is no definitive etiology for the disease. Several theories include (1) pilonidal disease is caused by an embryologic arrest of the development of the sacrococcygeal area, resulting in incomplete fusion of the ectodermal segments causing sinus tracks and cysts; (2) pilonidal disease is an acquired disease from repeated local trauma, and combined with perspiration and lint in the natal cleft, fosters skin maceration with subsequent infection and abscess formation [1]. Interestingly, sinuses are rarely found in young children, but rather in individuals ranging from 15–30 years of age, refuting the first theory [2]. There is a prevalence of

*Correspondence to: J. Alexander Palesty, MD, St. Mary's Hospital, Department of Surgery, 56 Franklin Street, Waterbury, CT 06706.

Accepted 9 December 1999

pilonidal disease among those in the military, a.k.a. "Jeep drivers' disease," because of the local trauma, restrictive clothing, and potentially poor hygiene in the field, lending credence to the second theory.

Initial treatment of the acute pilonidal abscess is conservative therapy, including a course of antibiotics, and if the disease is refractory or recurs, incision and drainage. Once a quiescent phase has occurred, definitive treatment can be considered. For the more chronic pilonidal sinus, for which the patients present with chronic, malodorous drainage and an uncomfortable fullness in the natal cleft, the approach is less well defined. Simple curettage, de-roofing of the sinus with or without partial closure, and excision with or without primary closure, have all been used as therapeutic modalities. Diathermy, ionizing radiation, and chemical have also been tried less enthusiastically.

Nd:YAG laser photothermal surgery has been widely accepted as a modality for the treatment of hemorrhoidal disease because of its efficiency as both a cutting and hemostatic tool. Current reports in the literature does not address the use and effectiveness of Nd:YAG laser vaporization in the treatment of pilonidal disease, which has traditionally been treated by sharp excision and or electrocautery after the failure of conservative therapy. Recent advances in laser technology (decrease in size, availability, and efficiency) have allowed patients a choice of either Nd:YAG laser vaporization, CO_2 laser vaporization, KTP laser vaporization, or traditional surgical techniques.

We hypothesized that Nd:YAG laser surgery would be an excellent tool for pilonidal cystectomy, facilitating clean incisions, less bleeding, predictable tissue effects, decreased operating room time, decreased postoperative pain, and a shorter recovery period with a faster return to work for the patient. Lasers have been demonstrated to be effective in the prophylaxis of local dissemination of infection with beneficial sterilizing effects [3,4]. In the ever-changing market of surgical outpatient care, a surgeon must be aware of the optimal cost:benefit ratio as well as patient satisfaction and a successful outcome with minimal complications.

MATERIALS AND METHODS

A retrospective study was carried out for the 5-year period from 1993–1997. Patient charts with billing codes based on traditional pilonidal cystectomy and those performed with laser surgery were selected from our hospital database. Operating room data were collected to include type of procedure, length of operation, cyst dimensions, patient age, and gender. Also obtained were records of additional hospital stay, patient occupation, and co-morbid conditions.

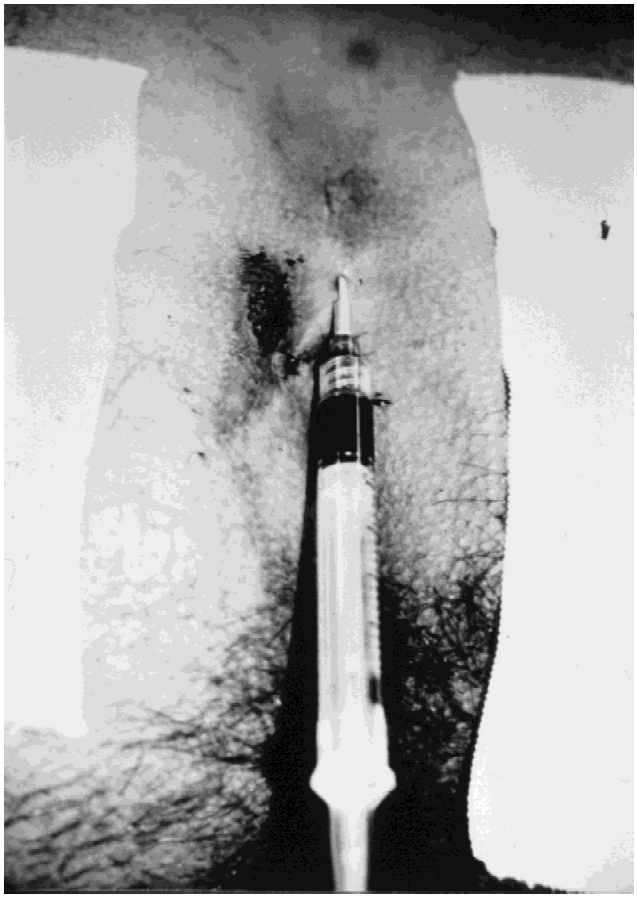

Fig. 1. Silastic catheter used to inject full-strength methylene blue dye.

All patients received one intravenous dose of a first-generation cephalosporin preoperatively. Our technique of laser-assisted pilonidal cystectomy uses the use of a chlorohexidine preparation to the sacrococcygeal area. The cyst punctum is accessed through the use of a Silastic catheter followed by injection of full-strength methylene blue dye (Fig. 1). The methylene blue allows for detection of the cyst margins so that any loculations can be easily identified and removed without invasion of the cyst cavity. Because the excision was performed outside the margins injected with methylene blue, differential absorption of la-

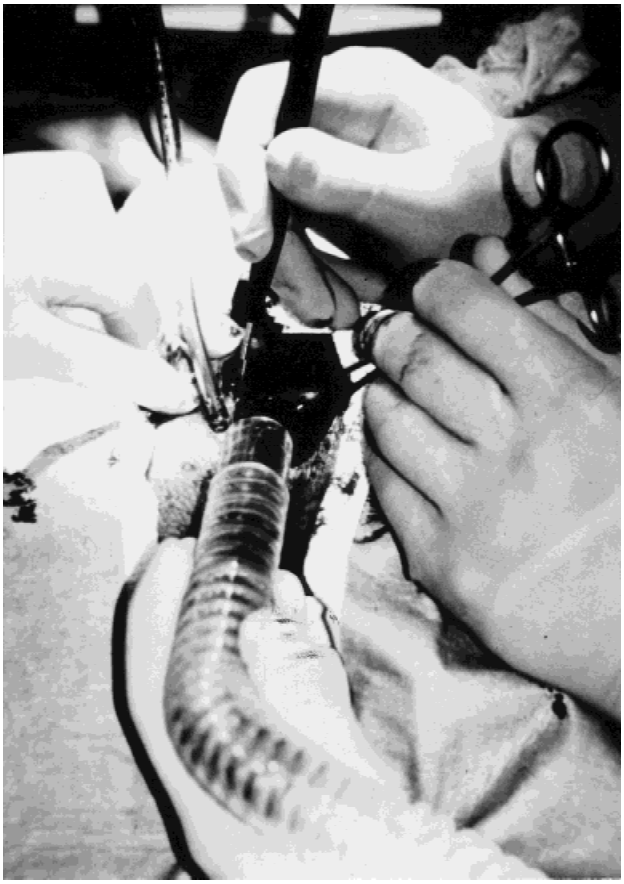

Fig. 2. Perioperative view.

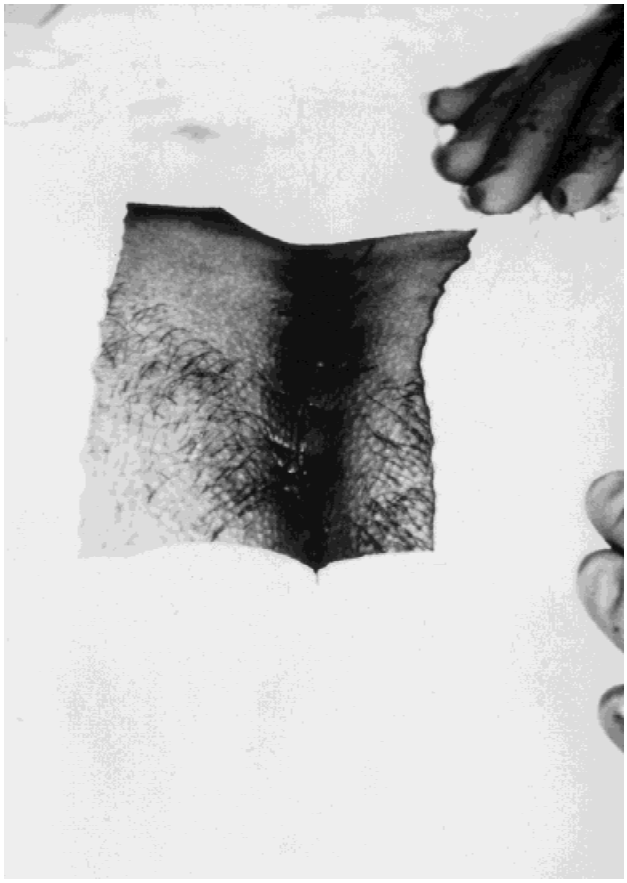

Fig. 3. Closure of the wound.

ser light and, therefore, increased energy absorption was not taken into consideration.

All procedures were performed with Surgical Laser Technologies CL60 (60 watt continuous wave 1064 nm laser) (Fig. 2). Pilonidal cyst excision was performed by using a sapphire contact laser (taper point ERP 2 tip) on continuous wave at 20 watts and coagulation of the tissue base after excision of the cyst was completed in noncontact mode with a bare fiber at 60 watts. All wounds were irrigated with Kanamycin antibiotic solution before closure.

The wounds were primarily reapproximated with absorbable suture, and skin apposition was completed with interrupted nonabsorbable monofilament vertical mattress sutures (Fig. 3). Primary closure was advocated because of the theory that a contact tip causes less collateral tissue damage compared with noncontact ablation. Bacitracin ointment was used to cover the incision site followed by a dry sterile dressing. In both groups, those patients who underwent the removal of an infected sinus had a quarter-inch Penrose drain temporarily left in place without any subsequent infections or scars.

Data were collected documenting the length of the debilitating period because of the pilonidal cyst. The period of convalescent time before return to work or resuming normal activity were obtained by telephone interview between 6 weeks and 6 months after the procedure. Postoperative convalescence was tabulated assessing pain through an analog pain scale, with 1 representing the mildest amount of discomfort and 10 representing the worst pain imaginable. Pain was assessed immediately postoperatively, 1 day postoperatively, and 1 week after surgery. Analysis of patient demographics was performed by using nonpaired t-tests.

RESULTS

The charts of 40 patients were reviewed, and each patient was contacted by telephone during the study period (Table 1). Patients reported their

TABLE 1. Pilonidal Cyst Demographic Data

	Traditional (n = 23)	Laser (n = 17)
Age (years)	25.8	24.4
Female/male	8/15	8/9
Hospital stay (days)	1	1
Operative time	60.2	42.3
Hospital charge	$1486.00	$1391.00
Anesthesia	General	General

pilonidal cyst produced discomfort for an average of 6.8 months. Twenty-three patients underwent traditional pilonidal cystectomy compared with the 17 patients who had Nd:YAG laser ablation of their pilonidal cyst. None of the resected pilonidal cysts were noted to have any extravasation of dye on either intraoperative gross examination or subsequent histologic examination. No bleeding was observed when using the laser for excision compared with steel scalpel. Scalpel excision resulted in extensive hemorrhage requiring electrocoagulation, which extended the operative time.

The average age of patients who underwent pilonidal cystectomy was 25.8 years, which was similar to the Nd:YAG laser group with an average age of 24.3 years. Sixteen of the 40 patients were women. Women composed 34.7% of the tra ditional pilonidal cystectomy group compared with 53.5% representation in the laser-treated group.

Patient histories revealed that 72.5% of patients had employment that required extended periods of seated time. Operative time was calculated and averaged 60.2 minutes for the traditionally excised pilonidal cyst compared with 42.3 minutes for the Nd:YAG laser cyst excision. Hospital cost for laser surgery was $310 per operative use at our institution. Operative cost averaged $18 per minute; therefore, overall surgical cost for the traditional excision was $1,486.00 compared with $1,391.00 for the Nd:YAG laser excision. Although laser excision was less expensive, there was no statistical significance for overall cost between the two groups.

Postoperative hospitalization was similar for both groups with all patients discharged on the same day of surgery. General anesthesia was used in both study groups. Postoperative antibiotics were not used in the laser-treated group, and 30.5% of the patients who underwent traditional pilonidal cystectomy received a course of postoperative antibiotics.

Patients treated with the Nd:YAG laser returned to work an average of 2.1 days earlier than those who underwent traditional pilonidal cystectomy (Fig. 4). This patient population reported the ability to sit without discomfort and drive comfortably an average of 1 day earlier than the traditional pilonidal cystectomy patient. Immediate postoperative pain was assessed by using an analog pain scale (Fig. 5), with laser-treated patients having a pain intensity of 3.5 compared with 5.0 for those treated traditionally. One day postoperatively, the pain intensity decreased to 2.9, compared with an increase of 5.1 with the traditionally treated group. The majority of laser treated patients had minimal to no pain 1 week after their operation, whereas the average pain intensity for the traditionally treated patients remained high at 2.3.

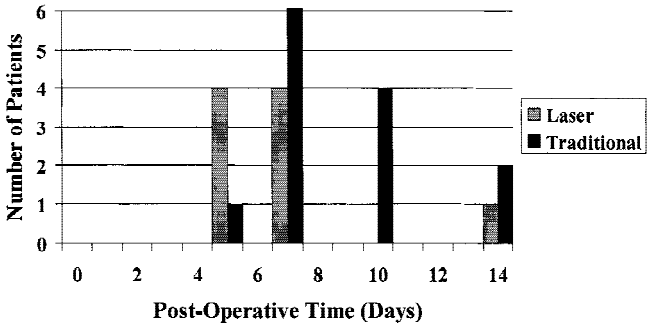

Fig. 4. Demonstration of quicker return to work for laser treated patients, the majority returning within 7 days.

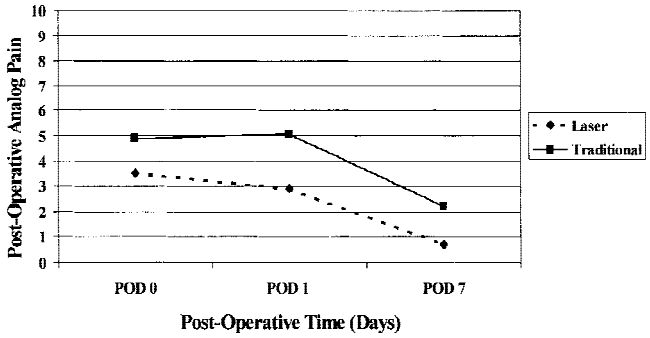

Fig. 5. Analysis of post-operative pain on an analog pain scale (0 = minimal, 10 = maximal).

DISCUSSION

The introduction of laser surgery in the 1970s initially brought with it a great deal of trepidation about using this resource as a cutting tool because of a poor understanding of the inter-

action of laser light with tissue. At its inception, there was very little control over the depth of penetration or the amount of adjacent tissue damage. The evolution of laser technology and a better understanding of the tissue effects based on absorption by different elements within the tissue has allowed for the expanded use of lasers [5,6].

Contact tips have allowed the Nd:YAG laser to emerge as a versatile hemostatic and cutting tool. Without a contact tip, a Nd:YAG laser's tissue absorption is relatively low, allowing for shallow temperature gradients, making it an excellent hemostatic tool, but one that is not particularly adept at cutting because it does not reach the high temperatures required for vaporization. The use of a contact tip on a Nd:YAG laser diminishes the dependence on the tissue absorption coefficient, because of the more efficient use of energy [7]. With any contact laser, less energy is lost to reflection and heat damage is limited, unlike the effect from a noncontact fiber. Hence, sapphire contact tips allow for fine cutting and tissue vaporization as well as deep coagulation.

Reports have demonstrated that thermal tissue effects caused by lasers are now more predictable and the Nd:YAG laser is indeed an effective modality for making incisions and manifesting improved hemostasis and lymphatic sealing [4–9]. This, in turn, decreases hematoma and seroma formation [10]. Our experience by using an Nd:YAG laser shows that it allows for tissue coagulation without the widespread lateral destruction and coagulation necrosis often seen with the use of standard Bovie electrocautery. There is less devitalized tissue when compared with electrocautery, allowing for immediate closure.

Wound strength for both techniques after 14–21 days of recovery has been shown to be similar; however, until that point, wounds created with a steel scalpel blade were stronger [5,10–12,13]. This finding may be attributed to the mild tissue coagulation at the edges of the wound or the increased inflammatory response caused by the Nd:YAG laser's thermal effects. Wound strength and healing between laser types is comparable and typical of thermal injuries [13].

In an era where the medical consumer makes decisions based on the efficacy of treatment by using criteria such as pain, length of hospitalization, and speed of return to work, laser surgery has emerged as a surgical modality that can fulfill these criteria for certain procedures. In our experience, patient postoperative satisfaction with outcome after laser excision of pilonidal cysts was significantly greater when compared with those who had traditional pilonidal cyst surgical excision. Their initial postoperative pain was considerably less, as was the pain experienced during the first week of recovery. Cost analysis revealed that although the use of the Nd:YAG laser does increase initial cost, operative time is 20 minutes less than those treated with traditional pilonidal cyst excision, allowing for no statistical total cost difference.

Our data demonstrate that patients who underwent Nd:YAG laser treatment had significantly less pain immediately postoperatively as well as less pain on the first postoperative day. One week postoperatively, Nd:YAG patients had minimal residual pain compared with the traditional excision group, who had complete resolution of pain nearly 21 days postoperatively. This retrospective review supports the hypothesis that Nd:YAG contact laser excision the for treatment of pilonidal disease is a cost-effective technique accompanied by less pain, allowing for an earlier return to work.

REFERENCES

1. Sabiston D. Textbook of surgery: the biological basis and modern surgical practice. 15th ed. Philadelphia: WB Saunders Company; 1997. p 1330–1332.
2. Cameron J. Current surgical therapy. 4th ed. St. Louis: Mosby-Year Book, Inc; 1995. p 250–253.
3. Chegin VM, Skobelkin OK, Brekhov EI. Laser surgery for soft tissue purulent diseases. Lasers Surg Med 1984: 4;279–282.
4. Laranne J, Lagerstedt A, Pukander J, Rantala I. Wound healing and soft tissue effects of CO2, contact Nd:YAG and combined CO2-Nd:YAG laser beams on rabbit trachea. Acta Otolaryngol (Stockh) 1997:117;909–917.
5. Tawakol M, Peyman G, Abou-Steit M. Wound healing strength: a comparative study of stainless steel blade excisions and contact Nd:YAG laser excisions. Int Ophthalmol 1988;12:147–149.
6. Midgley H III. Nd:YAG contact laser surgery: the scalpel of the future? Otolaryngol Clin North Am 1990;23:99–105.
7. Fuller TA. Thermal surgical lasers. Surgical Laser Technol 1993;27–40.
8. Iwasaki M, Sasako M, Konishi T, Maruyama Y, Wada T. Nd:YAG laser for general surgery. Lasers Surg Med 1985:5;429–438.
9. Mordon SR, Cornil AH, Buys B, Sozanski JP, Brunetaud JM, Moschetto Y. Development of controlled Nd:YAG laser for medical applications. Med Instrum 1987:21;223–225.
10. Johnson MA, Gadacz TR, Pfeifer EA, Given K, Gao X. Comparison of CO2 laser, electrocautery, and scalpel in-

cisions on acute phase reactants in rat skin. Am Surg 1997:63;13–16.
11. Carew J, Ward R, LaBruna A, Torzilli P, Schley W. Effects of scalpel, electrocautery, CO2 and KTP lasers on wound healing in rat tongues. Laryngoscope 1998: 108;373–380.
12. Hukki J, Lipasti J, Castren M, Foulakkainen P, Schröder T. Lactate dehydrogenase in laser incisions: a comparative analysis of skin wounds made with steel scalpel, electrocautery, superpulse-continuous wave mode carbon dioxide lasers, and contact Nd:YAG laser. Lasers Surg Med 1989:9;589–594.
13. Romanos GE, Pelekanos S, Strub J. Effects of Nd:YAG laser on wound healing processes: clinical and immunohistochemical findings in rat skin. Lasers Surg Med 1995:16;368–379.